Artificial Intelligence for Public Value Creation: An Impact Assessment Framework

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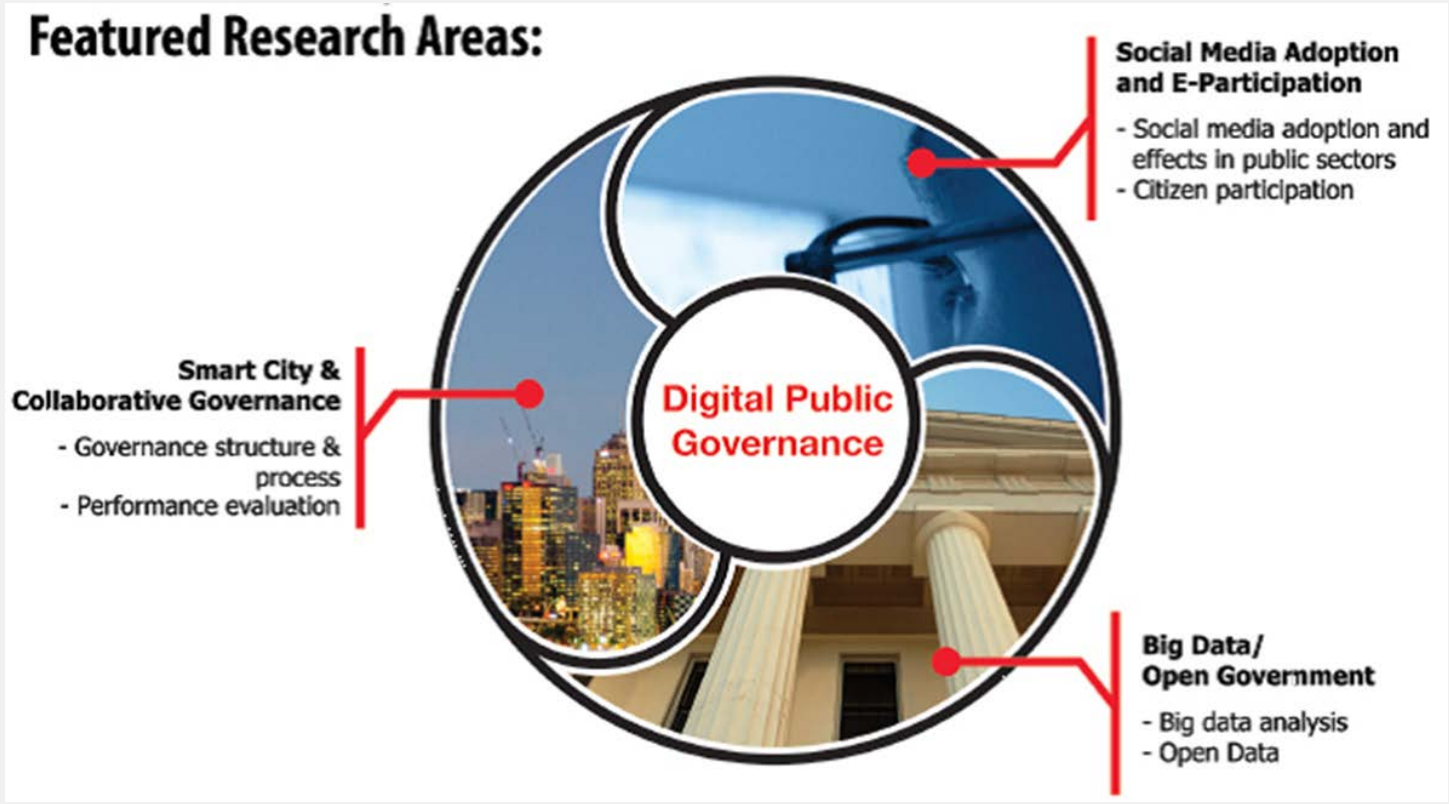
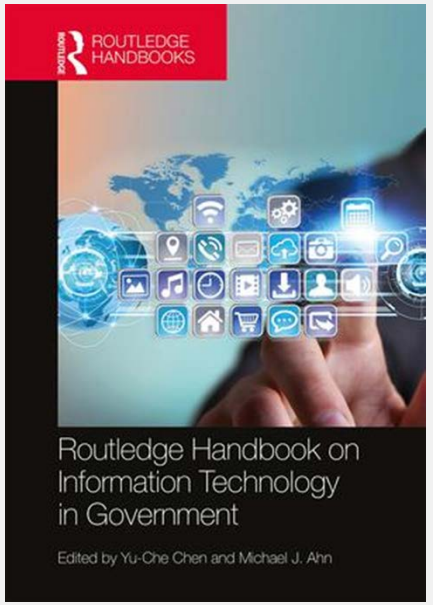
Global Digital Governance Lab



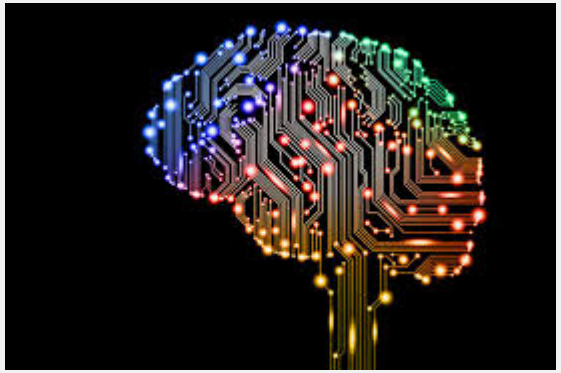


International Digital Government Research Conference, Digital Government Society 2020 in Seoul

AI: Definitions, Capabilities, and Applications for Public Service

Artificial Intelligence: Definitions

- "Artificial intelligence is
  - science and set of computational technologies
  - inspired by the ways people use their nervous systems and bodies to
  - sense, learn, reason, and take action." (AI & Life in 2030, 2016, p.4)



"Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment." Nils J. Nilsson, (AI & Life in 2030, 2016, p.12)

Artificial Intelligence: A Capability Perspective

- Machine learning
  - Large scale (with big data)
  - Predictive modeling
- Deep learning for multiple domains
- Computer vision
- Natural language processing
- Algorithm and computational social sciences
- Robotics
- IoT & AIoT

Cognitive capabilities

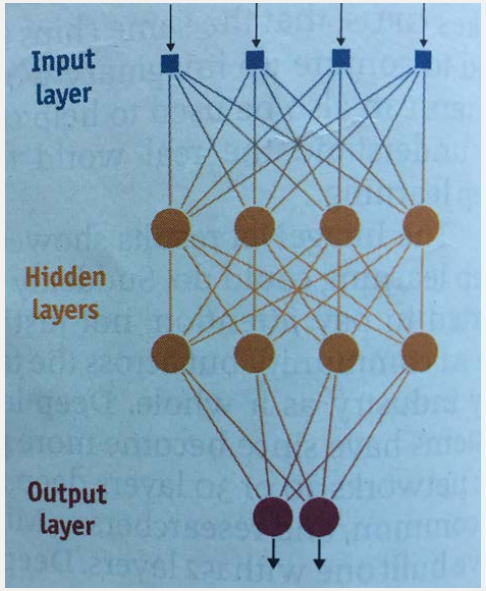
Advantages of AI in Public Service Production and Delivery

- Deal with complexity
- Relieve people from tedious work
- Command cognitive speed (i.e. facial recognition, natural language processing)

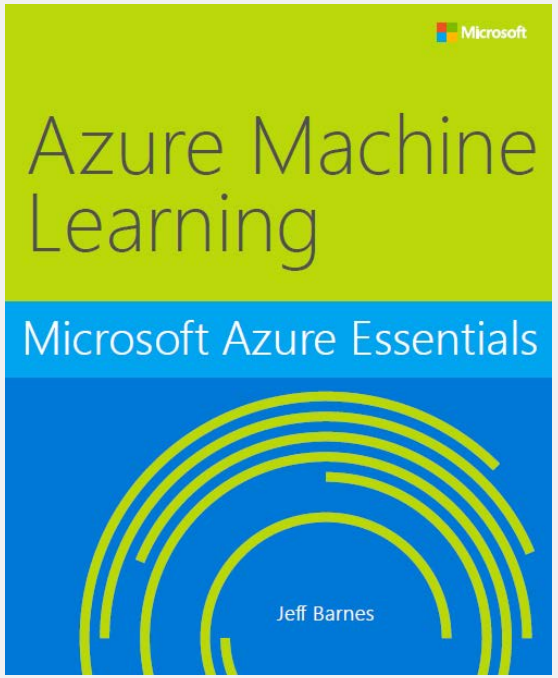
Machine Learning

- Start with data
- Choose models (statistical, cluster, ML)
- Allow the machine to develop algorithm
  - Neural network
- Assess model fit and fine-tuning

Data are foundational: relevancy, availability, quality



Source: The Economist, June 25, 2016



Deep Learning: Three Varieties

Supervised learning: "train a system with the aid of a labelled set of examples" (classify images) (p.5)

Unsupervised learning: search for things when you do not know how they look like (recognize features, cluster similar examples, revealing hidden groups links, patterns within the data) (p.6)

Reinforcement learning: between supervised and unsupervised (i.e. occasional feedback in the form of a reward) (p.6)

Source: The Economist, Special Report on AI

AI Applications for Public Service

Citizen/Client Services	Emma at USCIS; Chatbot; technology helpdesk
Transportation/ Mobility	Self-driving vehicles (reducing traffic fatalities, improving mobility & productivity); air traffic (ERAM: En Route Automation Modernization: 2015); San Diego (Adaptive Traffic Systems)
Urban management	Smarter and safer cities (security, video & sensor information, law enforcement etc.)
Healthcare	Precision medicine, prescription, faster diagnosis etc. Clinical Reasoning System using IBM Watson (Department of Veterans Affairs)
Cybersecurity	Detecting & responding to threats
Finance	Leveraging big data, higher accuracy; FSI (Financial Service Industry) application: fraud detection, credit risk, customer analytics, & regulatory compliance)

AI for Smart Cities

AI priority order investment purposes

1. AI for Analytics
2. AI for Automated Traffic Control
3. AI for Infrastructure Inspections
4. AI for Benefits Eligibility
5. AI for Physical/ Digital Robotic Controls, Robots (including Humanoid Robots)

Top 5 AI items used

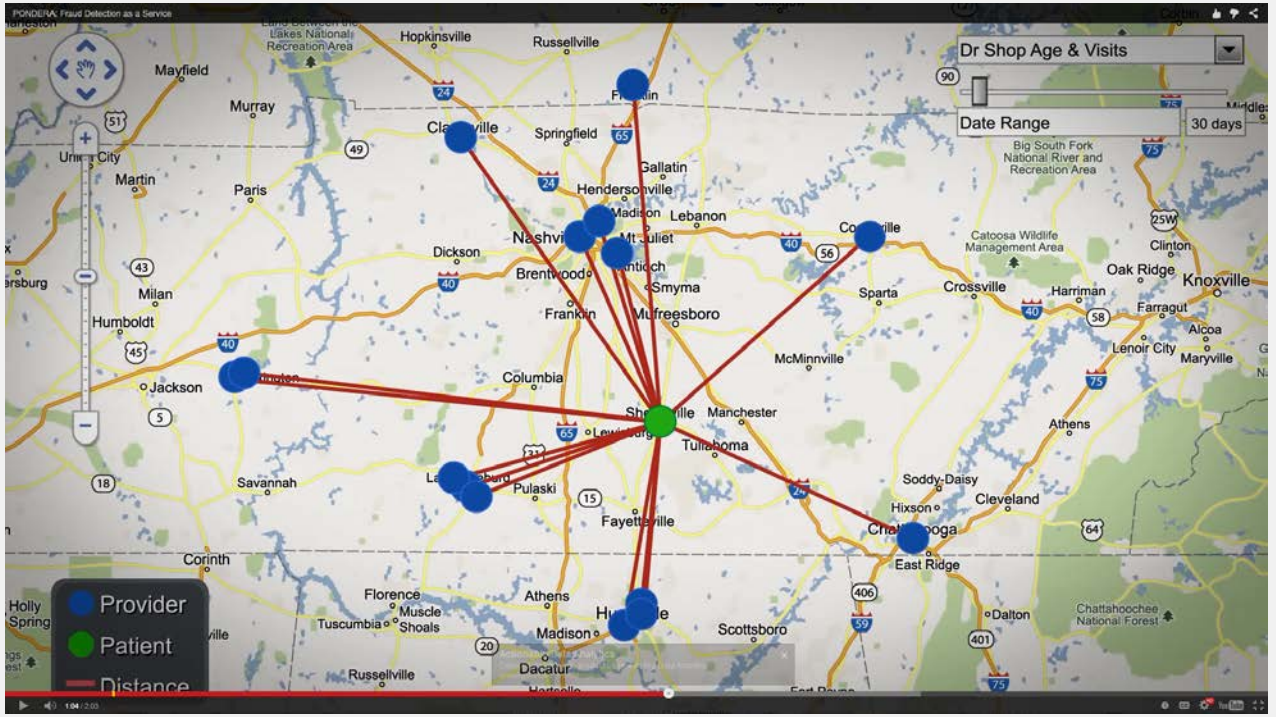
1. GeoSpatial/ Mapping 53%
2. Cybersecurity 48%
3. Predictive Policing 34%
4. eDiscovery 32%
5. Predictive Analytics 20%

http://www.govtech.com/dc/digital-cities/digital-cities-survey-2017-winners-announced.html

AI Impacts on Public Values

Creation of Public Values

- Effectiveness (i.e. finding service info., mobility)
- Efficiency (i.e. detect fraudulent activity)
- Impartiality (Max Weber)



Potential Negative Impacts on Public Values

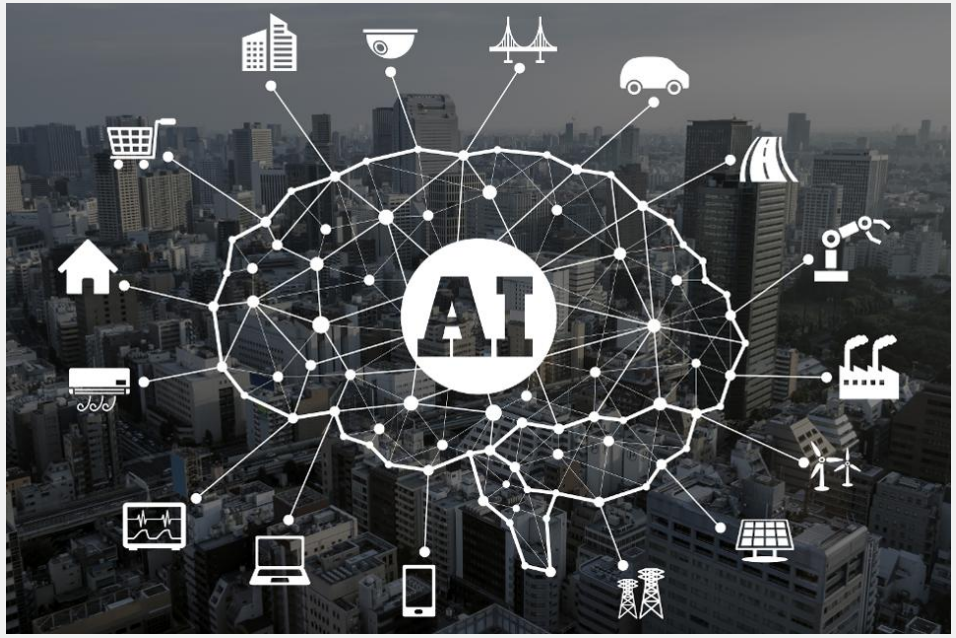
- Inequality
  - reinforcing existing bias (data)
  - automating poverty
- Reduction in transparency of policy and service decision-making
  - machine learning makes the algorithm more opaque
- Compromise humans' autonomy and critical thinking
  - Recommendations made by AI that influence our perception and decisions (i.e. fake news, rumors)

Potential Negative Impacts on Public Service and Society

- Take away the discretion of street-level bureaucrats to be citizen agents (Bovens and Zouridis, 2002; Busch & Henriksen, 2017)
  - Difficulty for public servants to be citizen agents as advocated by Maynard & Moody
- Potential replacement of human agents in public service
  - Changing role of civil servants
  - Wholesale displacement (AI's ability to move from specialized to generic service capabilities)
- Diminished consideration of public values

Gap in the Literature

- Limited sophistication in understanding artificial intelligence
- More on the problems/debate and less on the potential solutions
- Missed the opportunity to have a broader and interdisciplinary inquiry



A Public Value Assessment Framework

Public Values

- Move beyond instrumental and narrow scope (Cordella and Bonina, 2012)

Three categories of Public Values

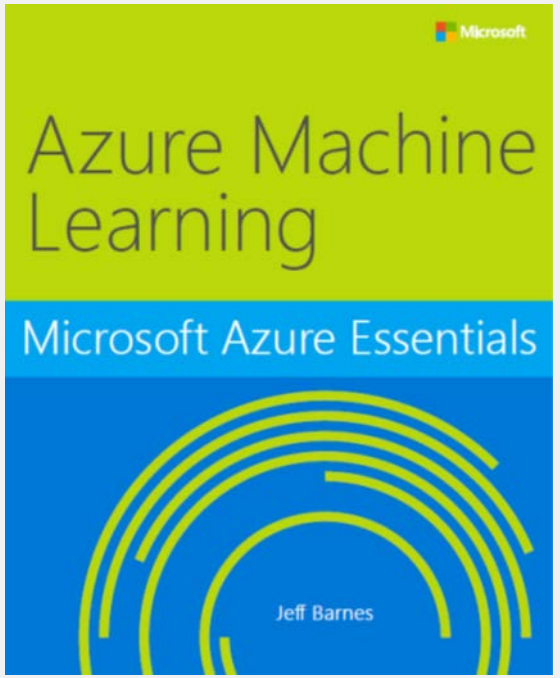
Duty-oriented	Service-oriented	Socially-oriented
Proper use of public funds	Responsiveness	Equality of treatment and process
Accountability	Respect to the individual	Inclusiveness
Economy	Transparency	Justice (impartiality)
Responsibility to citizens	Efficiency	Fairness
Responsibility to elected officials	Service to the citizen in his/her different roles	Privacy/security

Source: Bannister and Connolly, GIQ, 2014

Fundamental Challenges

- Data collection and governance
- Methodological transparency
- Trade-offs of public values
- Short-term orientation of political and policy decisions
- Instrumental vs. societal (scope of public agencies)

Datapolis: A Public Governance Perspective on "Smart Cities"
Albert Meijer



Governance Structure

- Collaborative
  - Governmental agencies
  - Cross-sector
- Interdisciplinary
  - Technical: technology and data
  - Management
  - Subject area expertise
- Stakeholder-focused
  - Diverse types of stakeholders (users, producers, policy makers, civic groups)

Governance Process

- Collaboration dynamics
  - Principled engagement, shared motivation, and capacity for joint action (Emerson et al., 2012)
- ICT-enabled innovative governance mechanisms
  - Co-production, crowdsourcing, etc
- Stakeholder participation
  - Civic groups due to societal impact

Adaptability and Future-oriented

- Agile governance
- Monitoring development
- Forecast future: scope, speed, and scale
- Frequent update and informed discussion/debate

Breakthrough Points

- From special purpose AI to a general purpose one (sense, learn, reason, and take action)
- **Superiority in sensing, reasoning, and acting** (i.e. facial recognition, natural language processing, make predictions, adapting)

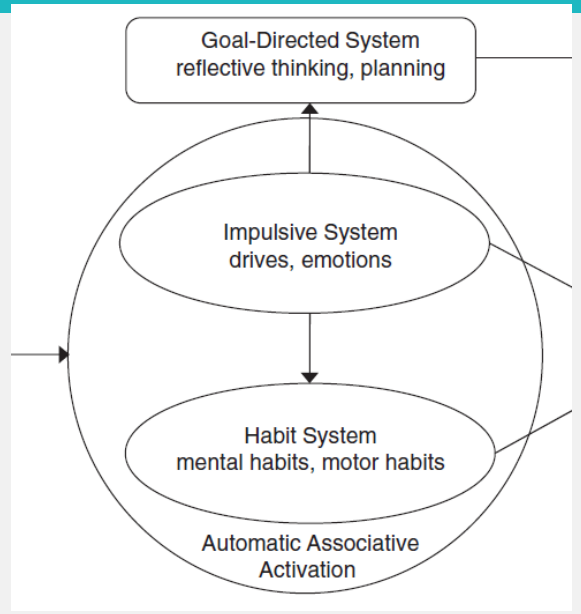
Impacts

- Various public values & trade-offs
- Job displacement (routine cognitive or manual)
- Policy and service decisions made by machines
- Diminished consideration of public values (ethics, equity, rights etc)

Future Research Agenda and Opportunities

Human-Machine Collaboration

- Machine-augmented human decision making
- Integration of cognitive systems (human and machine)
- How to get the best of both worlds
  - Optimize the creation of public values & minimize or compensate for the negative impact of AI
- Human and machine dynamics; architecture & design
  - Public servant as architect and designer



Source: Vlaev et al. 2016, Nudging in PAR

Cognitive system (sense), learning system (learn), decision/action system (act)

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Governance in the Age of Artificial Intelligence

"Traditional forms of service provisioning, policy-making and enforcement are changing due to the inclusion AI algorithms, mechanisms and techniques. The growing digitization of government operations, the universal datafication of societal activities, behaviors and sentiments, as well as the maturity and feasibility of big data techniques and applications have collectively laid down solid foundations for industrial-scale operationalization of AI across most governments and societal sectors." (CFP)

Smart Cities in the Age of AI
Artificial Intelligence for Good
Blockchain and Transformational Government
From data intelligence to data impacts: Tackling public problems with data
Social Media and Government in the Age of Artificial Intelligence
Maturity and Sustainability of Open Governmental Data
The Ethics of Artificial Intelligence: Implications for Digital Government
People, Government and Algorithms: Emerging forms of e-engagement with Artificial Intelligence